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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,878	08/22/2003	CENGIZ ESMER SOY	20.2797	1877
23718	7590	02/25/2005	EXAMINER	
SCHLUMBERGER OILFIELD SERVICES 200 GILLINGHAM LANE MD 200-9 SUGAR LAND, TX 77478			HUGHES, SCOTT A	
			ART UNIT	PAPER NUMBER
			3663	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

 <b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/604,878	ESMERSON ET AL.	
	Examiner	Art Unit	
	Scott A Hughes	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____.  | 6) <input type="checkbox"/> Other: ____.                                    |

DETAILED ACTION

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3-11, and 13-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Eaton.

With regard to claim 1, Eaton discloses a method of estimating velocity ahead of a drill bit disposed in a subsurface formation. Eaton discloses generating seismic waves at the surface from at least two different source 16 positions in the vicinity of a borehole traversing the formation (Fig. 1) (Column 7, Lines 1-13). Eaton discloses receiving seismic waves reflected from a reflector ahead of the drill bit at one or more locations 14 in the borehole (Column 6, Lines 4-34). Eaton discloses determining travel times of the seismic waves received at the one more locations (Column 6, Lines 36-51). It is known that inverting the travel times determines a velocity of the formation ahead of the drill bit (Wilhelm describing Eaton's methods, Page 1).

With regard to claim 3, Eaton discloses that the drill bit is at substantially the same depth for the different source positions (Fig. 1) (Column 6 Line 65 to Column 7, Line 22).

With regard to claim 4, Eaton discloses that the seismic waves are generated by at least one seismic source on the surface 16, 25 (Fig. 1).

With regard to claim 5, Eaton discloses that determining travel times of the seismic waves comprises determining arrival times of the seismic waves reflected from the reflector at the one or more locations (Column 6, Lines 5-64). Eaton discloses detecting the propagating times, and in order to do that, the processor would necessarily have to know the arrival time of the acoustic waves.

With regard to claim 6, Eaton discloses that receiving the seismic waves comprises detecting the seismic waves from at least one seismic receiver 14 at a location in the borehole (Column 6, Lines 17-34).

With regard to claim 7, Eaton discloses that the receiver is in a downhole tool near the drill bit (Column 3).

With regard to claim 8, Eaton discloses that receiving the seismic waves comprises sending a representation of the seismic waves to the surface via telemetry and processing the representation at the surface to determine travel times (Column 5, Lines 56-64; Column 6, Lines 30-35).

With regard to claim 9, Eaton discloses that receiving the seismic waves comprises processing the waves in the borehole to determine the arrival times and sending the arrival times to the surface via telemetry (Column 5, Lines 56-64; Column 6, Lines 30-35).

With regard to claim 10, Eaton discloses a system for estimating velocity ahead of a drill bit disposed in a subsurface formation. Eaton discloses at least one seismic source 16,25 (Fig. 1) on a surface for generating seismic waves from at least two different source positions in the vicinity of a borehole traversing the formation (Column

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6, Line 65 to Column 7, Line 22). Eaton discloses at least one seismic receiver 14 in the borehole for detecting seismic waves from a reflector ahead of the drill bit (Column 6, Lines 4-35). Eaton discloses a telemetry system for transmitting data between the seismic receiver and the surface (Column 5, Lines 56-64). Eaton discloses at least one processor adapted to process instructions for determining velocities ahead of the drill bit using travel times of seismic waves reflected from the reflector (Column 6, Lines 30-65). Eaton discloses that the data obtained is VSP data, and that there is a travel time and depth determination. It is known that a velocity can be estimated when time and depth are known. Eaton discloses that useful information can be determined from the travel times, and discloses that one of the pieces of information that is of interest to borehole drilling is pore pressure (Column 1, lines 7-50) which is known to be related to knowledge of velocity (Onyia, Background of the invention).

With regard to claim 11, Eaton discloses that the drill bit is substantially at the same depth for the different source positions (Column 7, Lines 1-22).

With regard to claim 13, Eaton discloses a tool that determines arrival times of seismic waves detected by the seismic receiver (Column 6, Lines 36-46). In order to determine a propagation time as disclosed, it is inherent that the processor would determine the time at which the acoustic energy arrived.

With regard to claim 14, Eaton discloses that the processor is further adapted to process instructions for determining the travel times from the arrival times (Column 6, Lines 36-46).

With regard to claim 15, Eaton discloses that the tool is located near the drill bit (Column 6, Lines 33-35).

With regard to claim 16, Eaton discloses that the seismic receiver is disposed on a drill string (Column 3, Lines 1-3).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 12, and 18-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eaton in view of Wilhelm.

With regard to claims 2, 12, Eaton does not disclose that the processor further comprises instructions for converting velocities to pore pressure ahead of the drill bit. Wilhelm discloses that it is known (Eaton's method) to be able to convert travel times to velocity measurements and that this information can be used to determine a pore pressure of formation ahead of the drill bit (Page 1, Introduction up to Page 2, Normal Trend). Eaton discloses finding overpressure and other formation properties ahead of the drill bit, along with performing a VSP of the formations surrounding the borehole. These same techniques and the same data acquired (received acoustic signals, depth measurements and depth intervals of the drill bit, travel times) are what are disclosed in Wilhelm as the information needed in the known techniques to convert interval travel

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times (which Eaton discloses as being obtained in Column 6) are converted to velocity and pore pressure measurement. It would have been obvious to modify Eaton to include using the travel time intervals to obtain pore pressure as disclosed by Wilhelm to be able to avoid over pressurized zones that could cause damage to the drill bit and borehole.

With regard to claim 18, Eaton discloses a method of estimating velocity ahead of a drill bit disposed in a subsurface region. Eaton discloses obtaining surface seismic data for a region of interest. Eaton discloses determining a travel time of a seismic wave generated from a surface of the region to a location in the borehole when the drill bit is at selected depths in the borehole during drilling of a borehole traversing the subsurface region (Columns 6 and 7). Eaton does not disclose inverting the surface seismic data to obtain a velocity ahead of the bit. Wilhelm discloses that it is known (Eaton's method) to be able to convert travel times to velocity measurements (Page 1, Introduction up to Page 2, Normal Trend). Wilhelm discloses inverting the surface seismic data to determine a velocity ahead of the drill bit while constraining velocity between the surface and the drill bit to be consistent with the velocity determined from the travel time. It would have been obvious to modify Eaton to include using the travel time intervals to obtain velocity measurements as disclosed by Wilhelm to be able to avoid over pressurized zones that could cause damage to the drill bit and borehole.

With regard to claim 19, Eaton discloses transforming the velocity ahead of the drill bit into pore pressure of a region ahead of the drill bit. Wilhelm discloses that it is known (Eaton's method) to be able to convert travel times to velocity measurements

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and that this information can be used to determine a pore pressure of formation ahead of the drill bit (Page 1, Introduction up to Page 2, Normal Trend). Eaton discloses finding overpressure and other formation properties ahead of the drill bit, along with performing a VSP of the formations surrounding the borehole. These same techniques and the same data acquired (received acoustic signals, depth measurements and depth intervals of the drill bit, travel times) are what are disclosed in Wilhelm as the information needed in the known techniques to convert interval travel times (which Eaton discloses as being obtained in Column 6) are converted to velocity and pore pressure measurement. It would have been obvious to modify Eaton to include using the travel time intervals to obtain pore pressure as disclosed by Wilhelm to be able to avoid over pressurized zones that could cause damage to the drill bit and borehole.

With regard to claim 20, Eaton discloses that the seismic wave is generated by a seismic source 16 positioned near an opening of the borehole (Column 7, lines 1-22) (Fig. 1).

With regard to claim 21, Eaton discloses that determining the travel time of the seismic wave comprises detecting the seismic wave from at least one seismic receiver at a location in the borehole (Column 6, Lines 36-46).

With regard to claim 22, Eaton discloses that the seismic receiver is disposed in a downhole tool near the drill bit (Column 3).

With regard to claim 23, Eaton discloses that determining the travel time further comprises measuring the arrival time of the seismic wave detected at the seismic receiver and determining the travel time from the arrival time (Column 6, Lines 5-64).

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Eaton discloses detecting the propagating times, and in order to do that, the processor would necessarily have to know the arrival time of the acoustic waves.

With regard to claim 24, Eaton discloses that measuring the arrival time comprises sending the seismic wave detected in the borehole to the surface and processing the detected wave at the surface to determine arrival time (Column 5, Lines 56-64; Column 6, Lines 30-35).

With regard to claim 25, Eaton discloses that measuring the arrival time comprises processing the seismic wave detected in the borehole to determine the arrival time and sending the arrival time to the surface via telemetry (Column 5, Lines 56-64; Column 6, Lines 30-35).

Claims 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eaton in view of Robbins.

With regard to claim 16, Eaton discloses that the seismic receiver is connected to the drill string (Column 3, Lines 1-3). Robbins discloses a similar system for conducting a VSP and for determining interval travel times with surface sources 170 and receivers in a borehole. Robbins discloses that the seismic waves are detected with receivers disposed on a drill string (Fig. 1) (Column 3, Lines 6-25). It would have been obvious to modify Eaton to include receiving the seismic waves with receivers disposed on the drill string in order to receive waves at multiple receivers in the same area of the tool and therefore have more data.

With regard to claim 17, Robbins discloses a clock for synchronizing, generating, and detecting the seismic waves (Columns 3 and 4). It would have been obvious to modify Eaton to include a clock as disclosed by Robbins in order to determine monitor the precise times the source was fired and the precise time the signal was received.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Onyia, who discloses determining pore pressure from velocity measurements obtained in VSP surveys.

Shook, who discloses a surface source generating waves detected by receivers in a borehole for use in detection of geo-pressure transition zones (pre pressure).

Bradshaw, who discloses a VSP method.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Hughes whose telephone number is 703-305-0430. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Tarcza can be reached on 703-306-4171. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



SAH



THOMAS H. TARCZA  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 3600